

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Appln No.:	10/736,595	)	<b>Confirmation No. 5884</b>
Filed:	December 17, 2003	)	
Applicants:	Arora et al.	)	This Declaration was electronically
Title:	PROCESS FOR SINGLE- STAGE HEAT TREATMENT AND GRINDING OF COFFEE BEANS	)	filed on November 14, 2007 using the
Art Unit:	1761	)	USPTO's EFS-Web.
Examiner:	Viren A. Thakur	)	
Attorney Docket:	1410/77081	)	
Customer No.:	48940	)	

Mail Stop AMENDMENT  
Commissioner for Patents  
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**DECLARATION OF VIJAY K. ARORA UNDER 35 C.F.R. § 1.132**

Dear Sir:

I, VIJAY K. ARORA, hereby declare and state as follows:

1. I am a co-inventor of the subject matter claimed in the above-identified application and currently work in a technology area closely related to the subject matter of the above-identified application.

2. I am employed by Kraft Foods ("Kraft") as a Kraft Foods Fellow in the Global Technology and Quality function. My current responsibilities include research,

development and commercialization of emerging processing technologies for Kraft products globally.

3. Prior to my employment by Kraft, I was employed by Maxwell House, a division of General Foods Corporation, as a Research Manager. My responsibilities included design, development and commercialization of processes for manufacturing roasted and ground, instant and freeze-dried coffee products for General Foods' businesses worldwide. I have over 15 years of experience in developing coffee products and processes.

4. I obtained a B.S. in Engineering from Indian Institute of Technology, Kharagpur, India (1970); an M.S. in Food Engineering from University of California, Davis (1972); and a Ph.D. in Food Engineering from University of Massachusetts, Amherst (1975).

5. I have reviewed the application, the Office Actions mailed October 4, 2006 and June 14, 2007, and the primary prior art reference cited by the Examiner Polifka (U.S. Patent Publication No. 2002/0027173). In addition, I am very familiar with the technology involved in the application in general, and the state of the art in that technology.

6. The presently claimed invention is directed to a single step coffee bean heat treatment and grinding process, wherein green coffee beans are introduced into an enclosure, "which are entrained in the heated air spiraling downward through the enclosure, wherein at least a portion of the green coffee beans are dried, roasted to induce pyrolysis, and ground before reaching the lower end of the enclosure. . . whereby the dried, roasted and ground coffee beans are obtained from the green coffee beans in a single step."

7. The present invention would not have been obvious to one of ordinary skill in the art at the time of the invention for a number of reasons. First, it is well known in the art that, in conventional methods, coffee is prepared using the two separate critical steps of: (1) roasting the whole green beans to a desired roast color for flavor and aroma generation; and (2) grinding the roasted whole beans into smaller size particles to accelerate release or extraction of coffee flavors, aromas and soluble solids during

the brewing operation. Second, the roasting step is known in the art to be quite different and significantly more complex than merely drying agricultural products using a conventional dryer or a vortex grinding apparatus such as described in Polifka.

8. For centuries, green coffee beans have been roasted as whole beans to ensure desired flavor, aroma and color development. Roasting is a time-temperature dependent process, whereby a number of chemical and physical changes are induced in the green coffee beans, including: (1) removal of moisture from the green coffee beans; (2) a sharp rise in bean temperature due to exothermic reactions; (3) initiation of Maillard reactions and pyrolysis for flavor, aroma and CO<sub>2</sub> gas generation; and (4) expansion of the coffee beans (density reduction). In conventional methods using continuous roasters, whole green beans must generally be roasted at a temperature above about 550 °F for at least about 120 seconds. The roasted whole beans are then sent to a granulator consisting of a series of steel rollers to produce smaller size coffee particles suitable for brewing.

9. Attempts to first grind the whole green beans and then roast have been unsuccessful due to several factors including: (1) mechanical difficulties in the grinding and handling of green coffee beans, which have a moisture content in the range of about 9% to 14% by weight depending upon the type of beans, results in the green beans being distorted and turned to mush during grinding; (2) the ground mush is difficult to fluidize in the roaster, which results in a brown mass with burnt specs due to non-uniform heat transfer in the roasting chamber; and (3) the lack of Maillard reactions necessary for flavor and aroma generation during roasting operation. The resulting product lacks the desirable characteristic coffee flavors, aromas and brew sourness.

10. Given this knowledge of the art, it was surprising and entirely unexpected to discover that the process of the present invention overcomes these problems and allows whole green coffee beans to be dried, roasted, and ground in a single step, and yet, provides a coffee product that is comparable with coffee that is roasted and ground using conventional methods. Indeed, despite the commercial advantages of a system capable of providing ground roasted coffee in fewer process steps and with less

equipment requirements than conventional methods, that need had been unsolved prior to the present Applicants' work.


11. Also surprising and unexpected was the discovery that the present invention could provide a roasted and ground coffee product at a significantly lower temperature and time exposure than required in conventional methods. While conventional methods require roasting for as long as 120 seconds or more at temperatures of at least about 550 °F, the present invention requires less than a minute (generally about 15-20 seconds) at temperatures within the range of 375 °F to 450 °F

12. Another unexpected result was the fact that the present invention provided a darker roasted product with milder flavor and less bitterness than conventionally prepared coffee products. This was particularly surprising because dark roasted coffee beans invariably exhibit harsh, bitter and strong flavor notes. The ability of the single step process of the present invention to decouple roast color and flavor intensity relationship is a unique and unexpected finding allowing a product that is darker in roast color but milder in brew flavor.

13. In view of the foregoing, one of ordinary skill in the art would not reasonably expect that a vortex grinding apparatus, such as described in Polifka, could be used with whole green beans in a process to provide dried, roasted, and ground coffee beans, in which the dried, roasted and ground coffee beans are obtained from the whole green coffee beans in a single step.

The undersigned, being warned that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. §1001) and may jeopardize the validity of the application or any patent issuing thereon, hereby declares that the above statements made of my own knowledge are true and that all statements made on information and belief are believed to be true.

Date: 14-November-2007

  
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Vijay K. Arora